

Possible Responsibility of Silicone Materials for Degradation of the CO₂ Removal System in the International Space Station

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From data concerning the degradation of the CO₂ removal system in the International Space Station (ISS) two important features were apparent:

- 1 The atmosphere within the International Space Station (ISS) contained many organic compounds including alcohols, halocarbons, aldehydes, esters, and ketones, *inter alia*. Various cyclosiloxanes Dn, hexamethylcyclotrisiloxane (D3) and its higher homologs (D4) and (D5) are also present presumably due to offgassing.
- 2 Screens within the zeolite-containing canisters, used for the removal of CO₂, exhibited partial clogging due to zeolitic fragments (dust) along with “sticky” residues, that *in toto* significantly reduced the efficiency of the CO₂ removal process.

Samples of the ISS fresh zeolite, used zeolite, filter clogging zeolite particles and residual polymeric materials were examined using, *inter alia*, NMR, EM and HRSEM. These data were compared to equivalent samples obtained prior and subsequent to Dn polymerization experiments performed in our laboratories using the clean ISS zeolite samples as catalyst. Polysiloxane materials produced were essentially equivalent in the two cases and the EM images demonstrate a remarkable similarity between the ISS filter zeolite samples and the post-polymerization zeolite material from our experiments. In this regard even the changes in the Al/Si ratio from the virgin zeolite material to the filter samples and the post-polymerization laboratory samples is noteworthy.

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